

RECOMMENDED WATER QUALITY MONITORING ELEMENT OF THE EMP

CONCEPTUAL FOUNDATION

Guiding Principle: The hydrologic cycle and hydrodynamic transport processes control temporal and spatial variability in water quality conditions of the upper estuary.

Recommendation: To adequately monitor status and trends at seasonal to yearly timescales, the EMP sampling design must take into account the inherent temporal and spatial variability imposed by the hydrologic cycle and hydrodynamic transport processes.

Temporal variability at a point and spatial structure are connected through the currents

TEMPORAL VARIABILITY

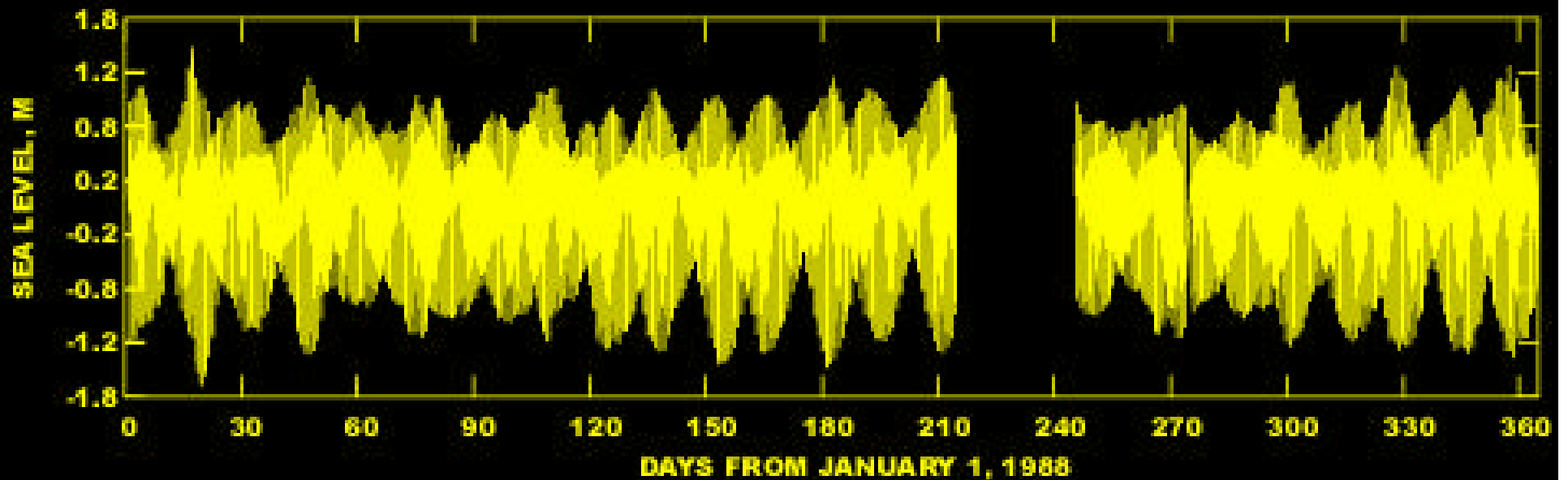
Tidal timescale: Advection by the tidal currents of along-channel spatial gradients in water quality variables create large temporal variations in time-series measured at fixed locations.

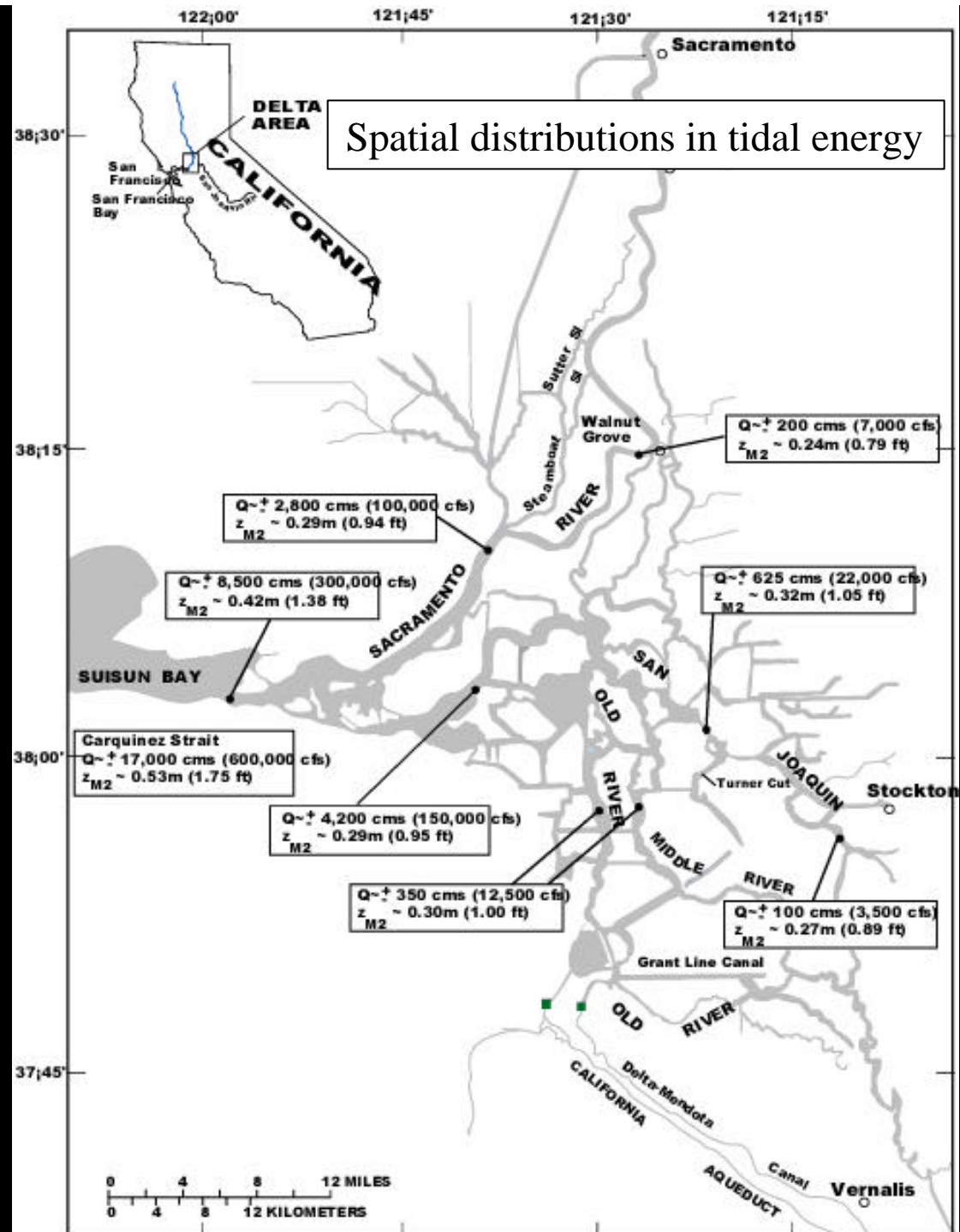
Fortnightly timescale: Spring-neap variations in tidal dispersion and in the residual currents can introduce strong signals in water quality variables.

Seasonal timescales: Seasonal variations in river flows, project operations, and tides (solstices versus equinoxes) lead to variations in water quality variables.

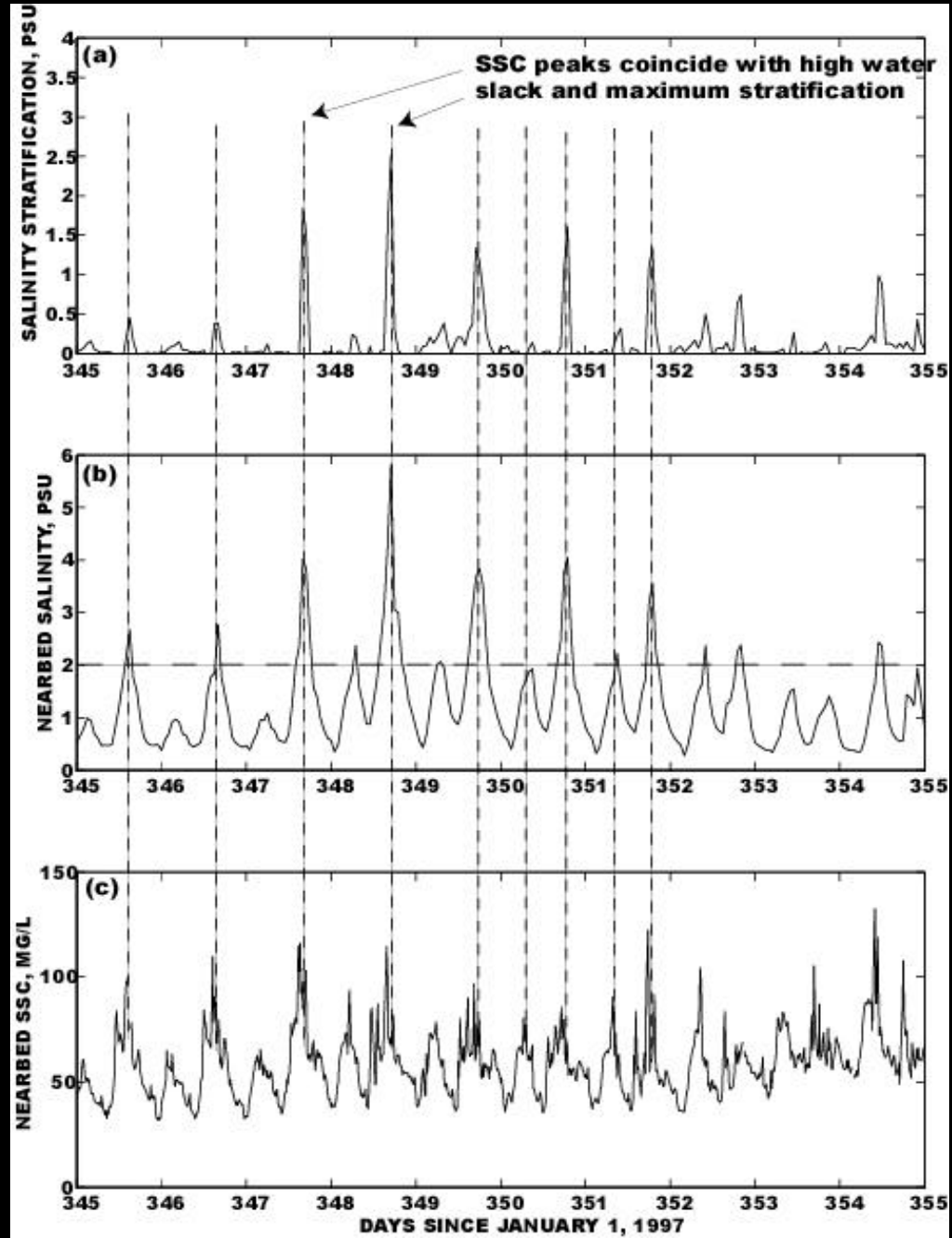
Macro Tidal System

Sea Level measured at Presidio

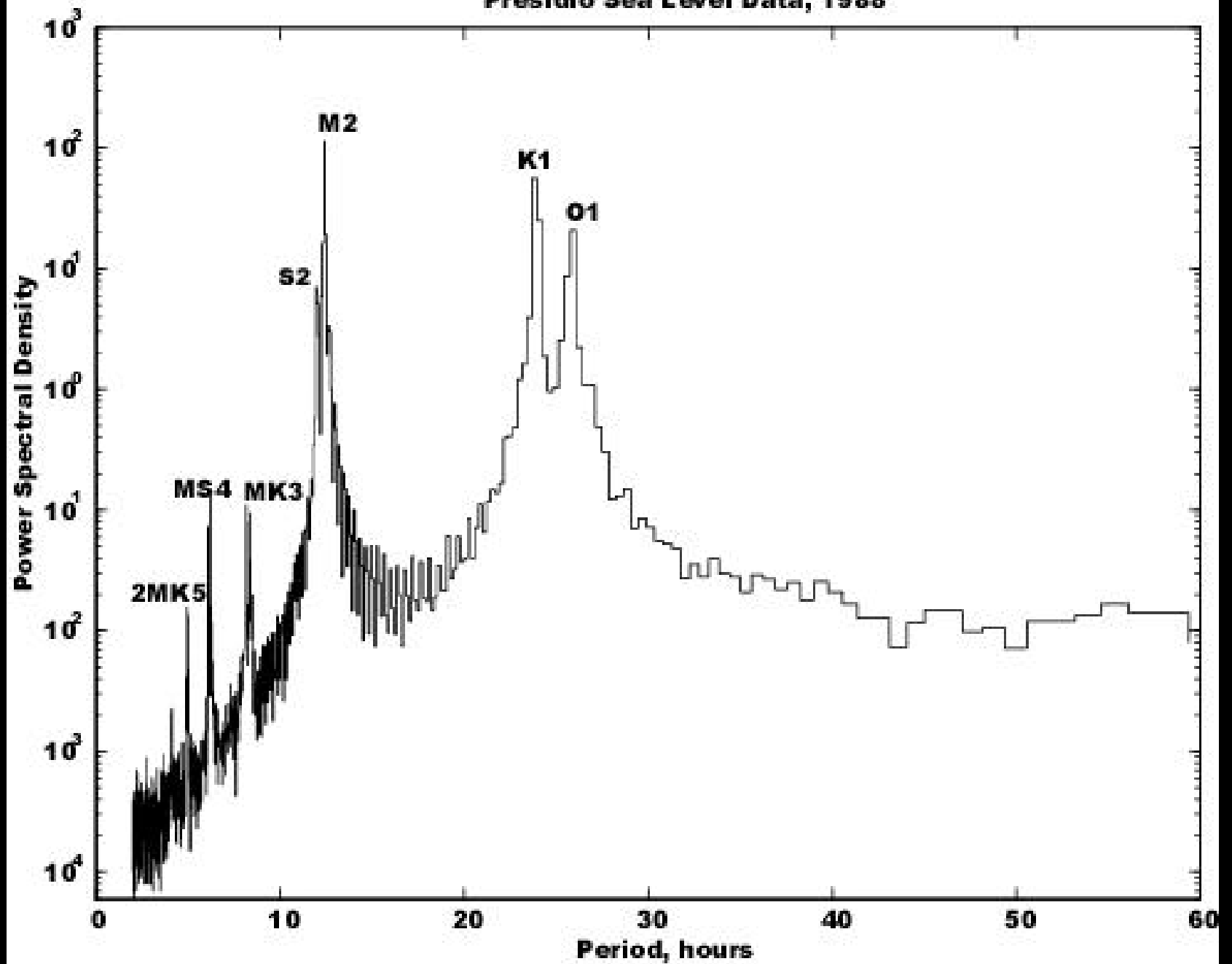


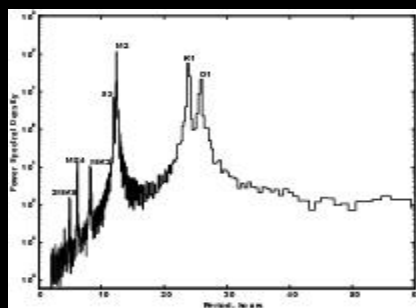


Tidal Timescale variability is ubiquitous

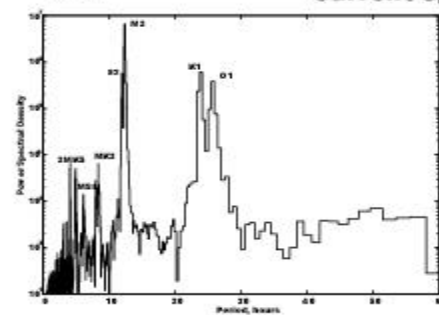


Presidio Sea Level Data, 1988

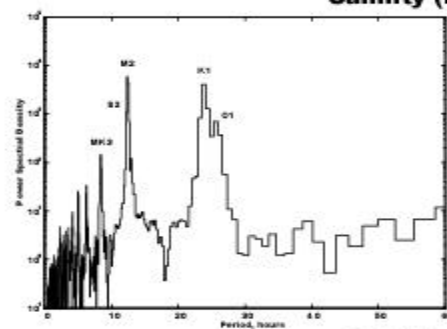




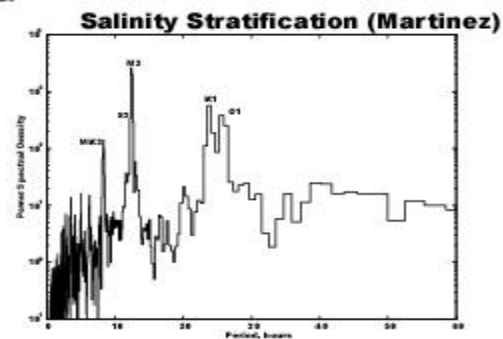
Sea Level (gg)



Current Speed (Bulls Head)

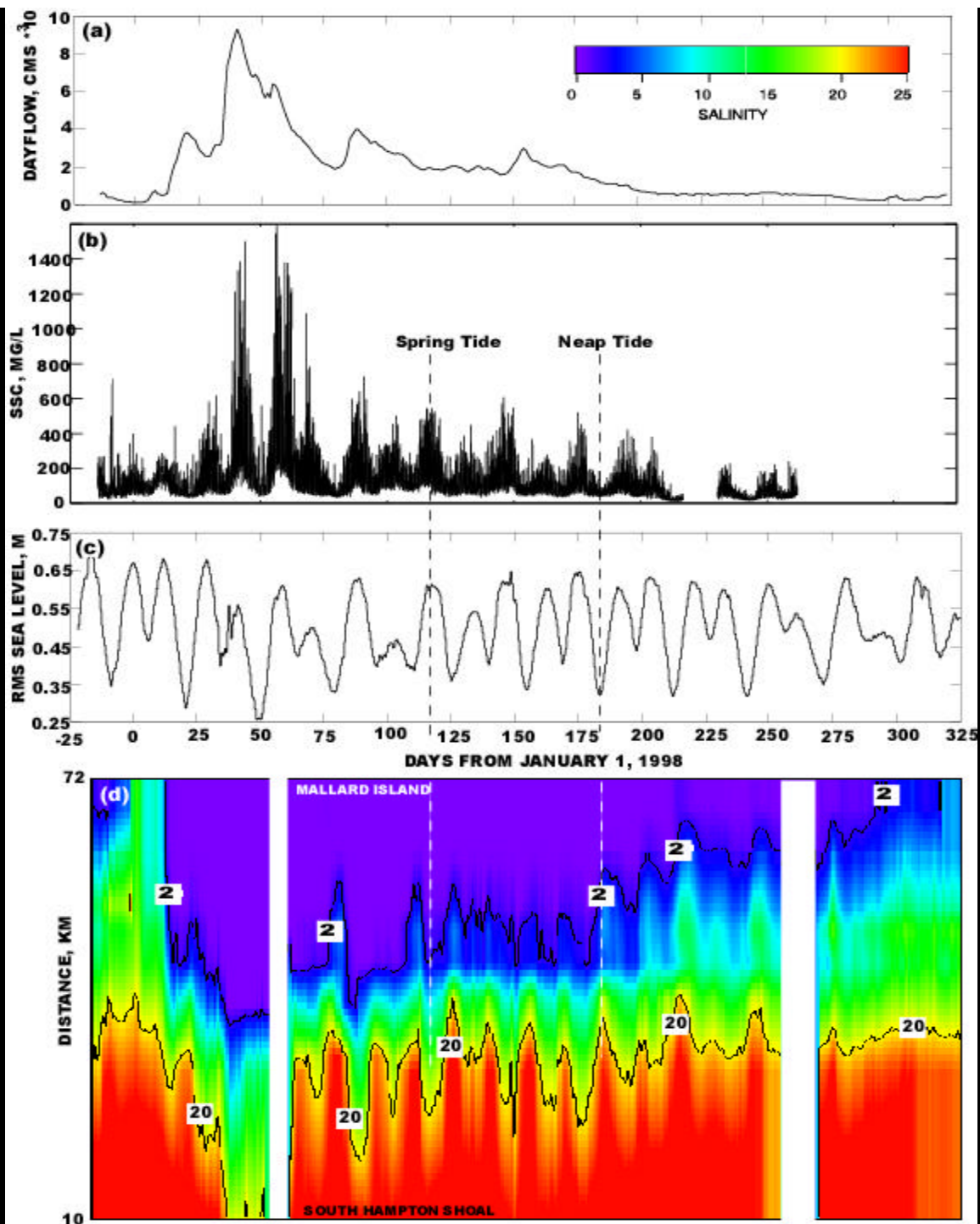


Salinity (Martinez)



Salinity Stratification (Martinez)

Energy Cascade



SPATIAL VARIABILITY

Forcing (Advection : Dispersion):

Riverine versus Tidal
Barotropic versus Baroclinic (X2)
Continuous versus point source

Length Scales

Wide versus Narrow
Deep versus Shallow

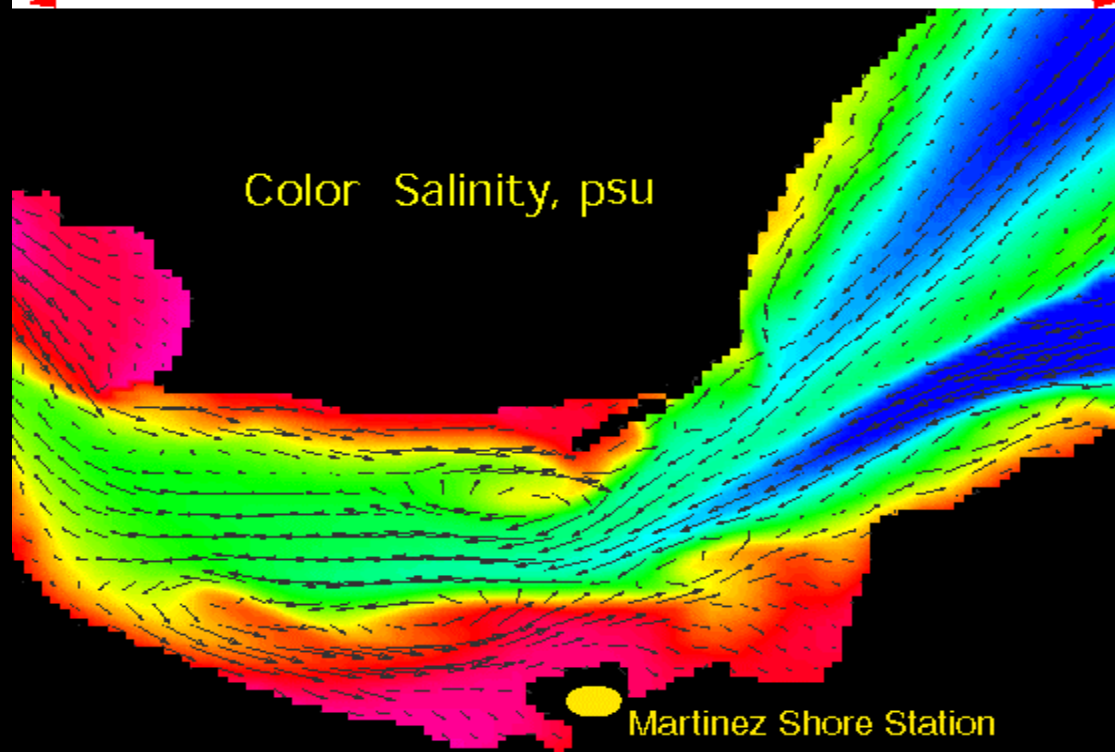
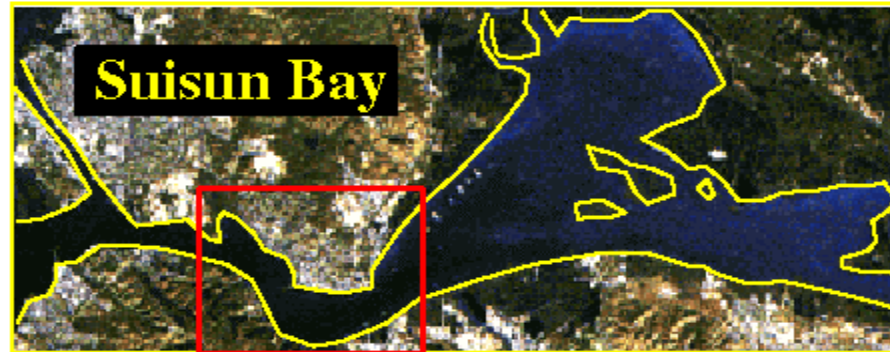
Geomorphology

Single Channel
versus
River Bend
versus
Channel Network
versus
Shallow/channel System

Lateral Variability

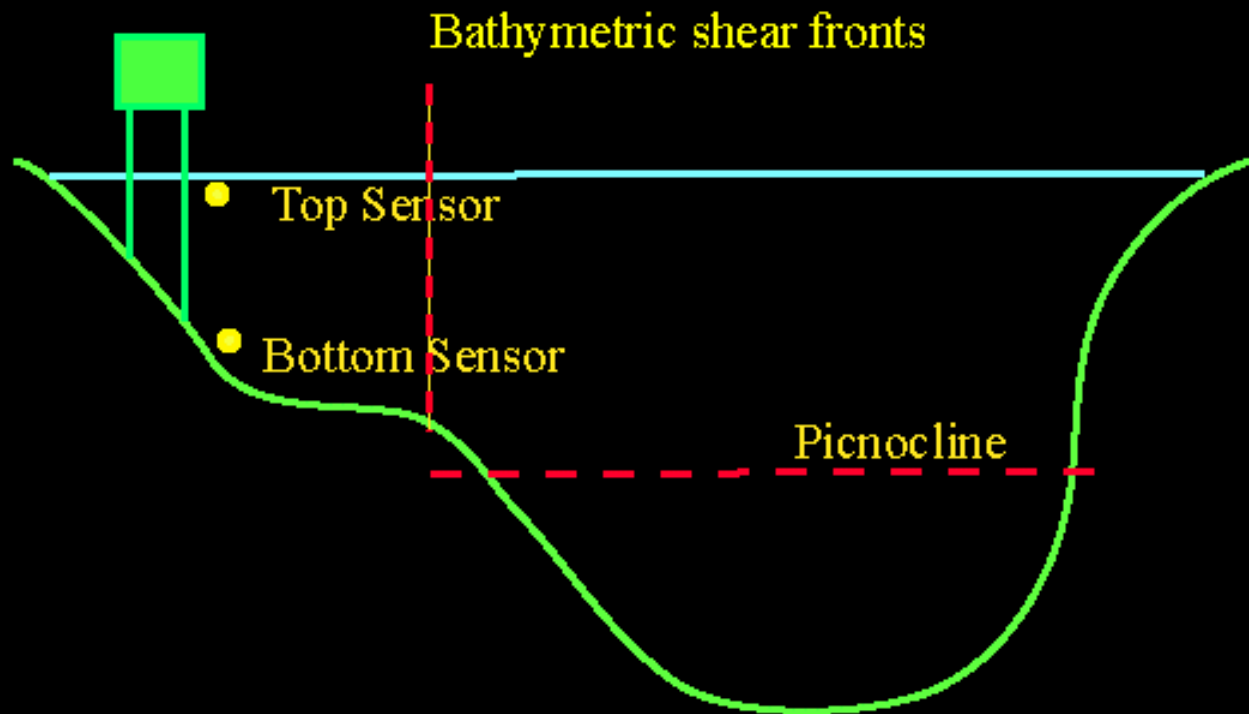
Horizontal Dispersion

Tidal Currents Turn First in Shallows

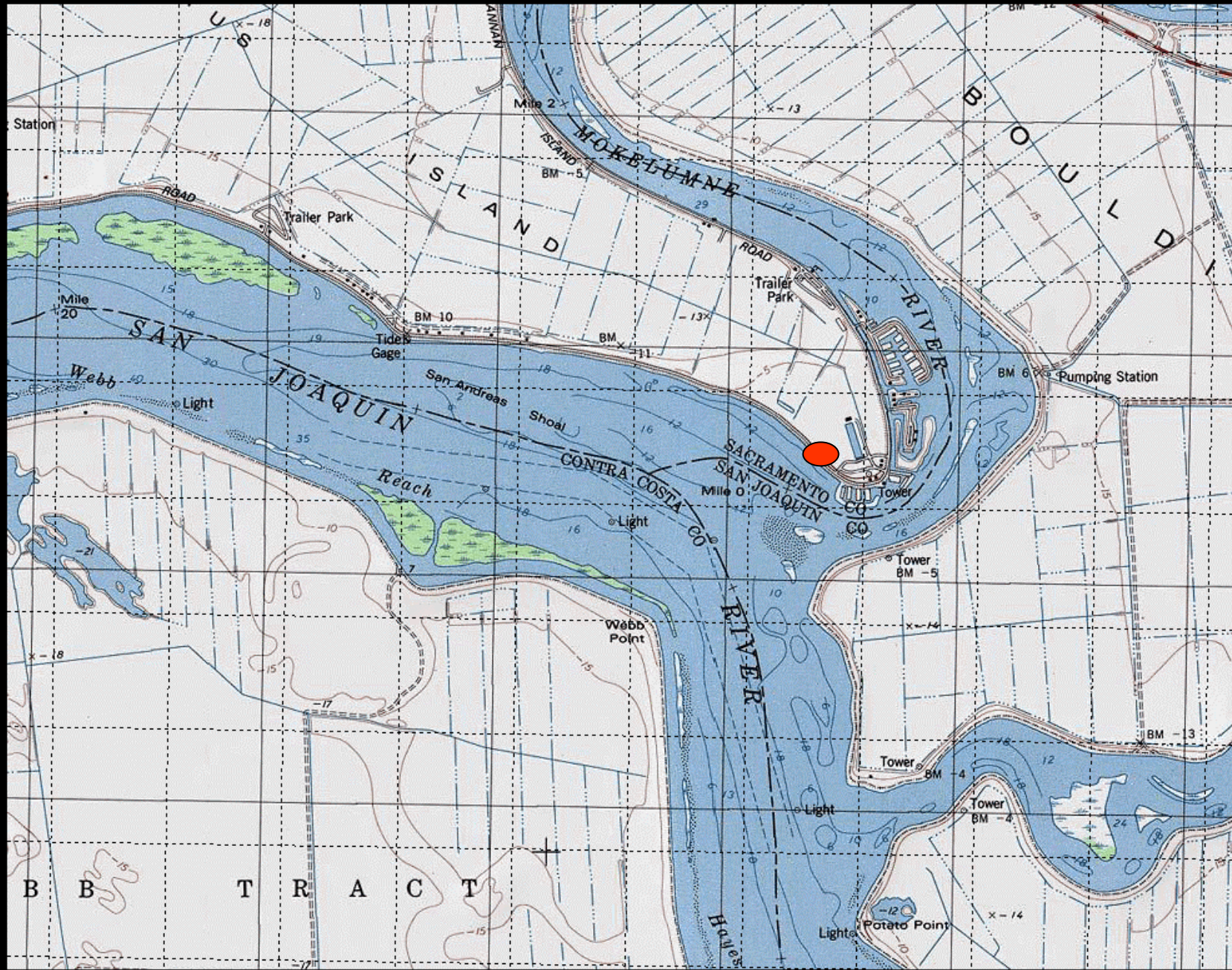


Shore Station

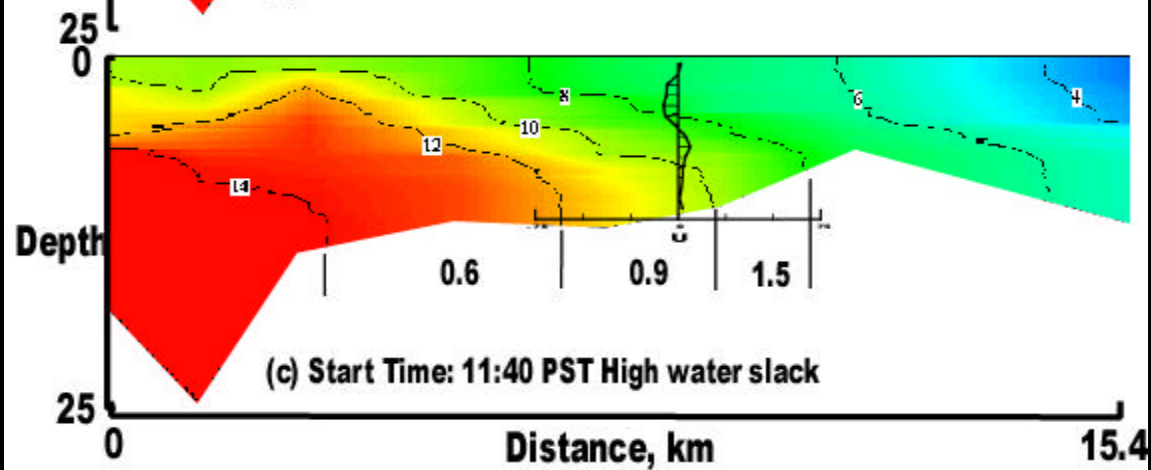
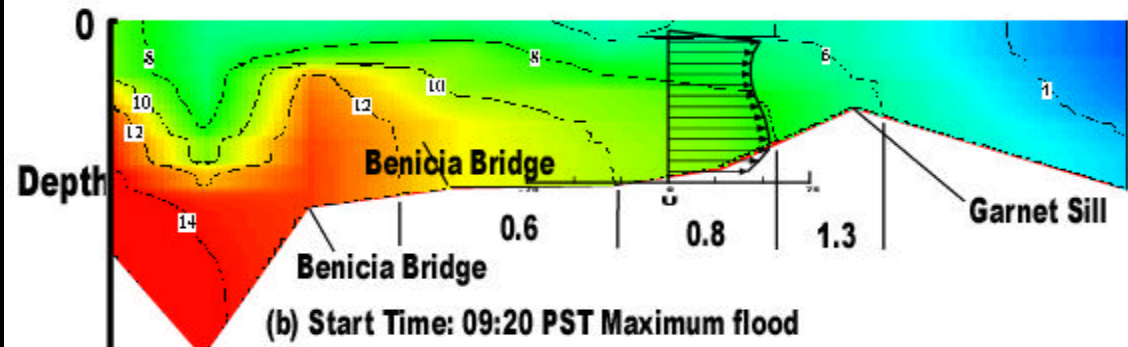
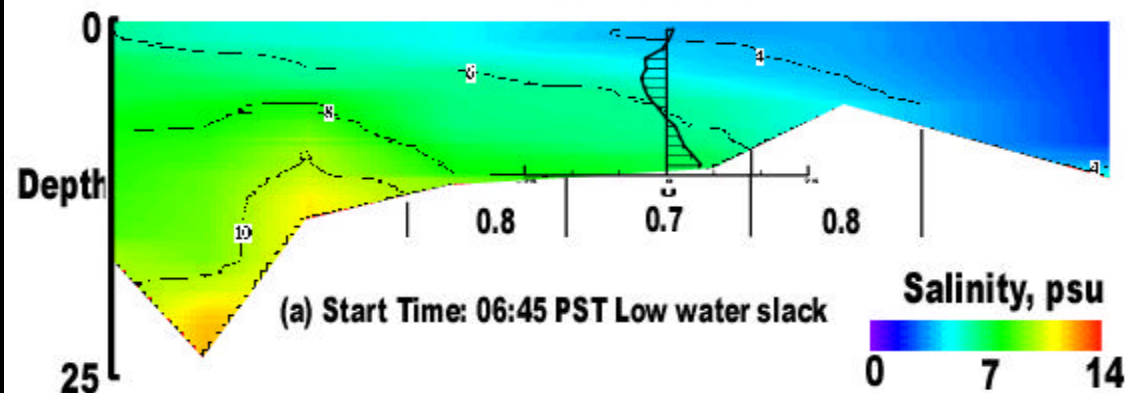
Lateral and Vertical Variability



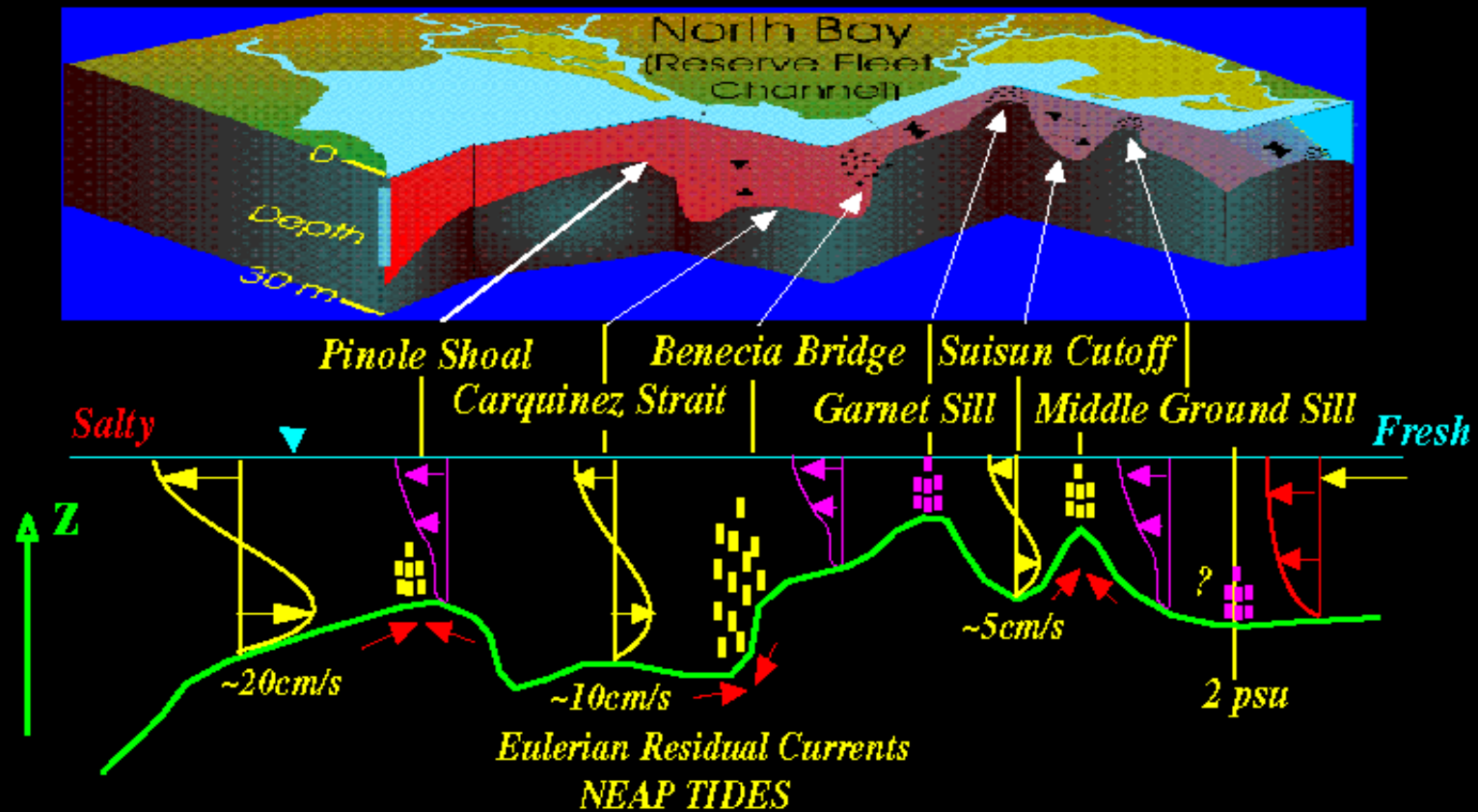
Lateral Variability can be a problem in the Delta also



Date: 6/26/96



EXAMPLE CONCEPTUAL MODEL



Legend



Representativeness: Collect data that “best” represents the local area where the measurements are made (lateral and vertical variability).

Continuity: Consider historical database.

Data management: A data management system – including quality assurance and dissemination— designed to efficiently transfer data into information should be established.

Continuous over discrete sampling: Continuous monitoring takes into account tidal aliasing and is amenable to a greater range of analytical techniques.

Estimate loads: Co-locate the collection of water quality and flow data to permit calculations of loads or fluxes.

Discrete sampling: Alternate sampling between spring and neap tides to reduce fortnightly period biases.

Characterize water column structure: Collect vertical profiles in regions where vertical variability exists.

Incorporate new techniques: Continually evaluate and incorporate new methods into sampling protocols.